Topic 07 SL Exam – Equilibrium/Kinetics/Energetics MS

1. D
2. B
3. B
4. C
5. D
6. C
7. C
8. D
9. C
10. D
11. C
12. C
13. B
14. B
15. B
16. C
17. A
18. B
19. B
20. D

21. (a) (i) $K_c = [SO_2Cl_2] / ([Cl_2][SO_2]$ ***[1]***

Ignore state symbols.

Square brackets [ ] required for the equilibrium expression.

(ii) value of K_c increases;
$[SO_2Cl_2]$ increases;
decrease in temperature favors (forward) reaction which is exothermic; ***[3]***

Do not allow ECF.

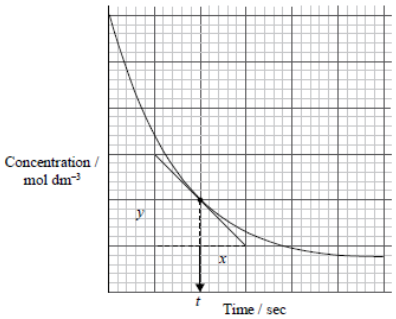
(iv) no effect on the value of K_c / depends only on temperature;
$[SO_2Cl_2]$ decreases;
increase in volume favors the reverse reaction which has more gaseous moles; ***[3]***

Do not allow ECF.

(v) no effect;
Catalyst increases the rate of forward and reverse reactions (equally) / catalyst decreases activation energies (equally); ***[2]***

(b) labeled axes (including appropriate units);
correctly drawn curve;
correctly drawn tangent;
rate equal to slope/gradient of tangent (at given time) / rate = (*y/x)* at time *t*; ***[4]***

[3 max] *for straight line graph or graph showing product formation.*



(c) (i) increases rate of reaction;
molecules (of H_2O_2) collide more frequently / more collisions per unit time;

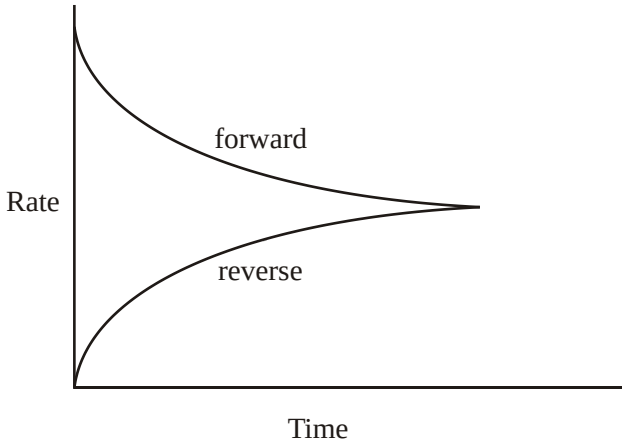
No ECF here. ***[2]***

(ii) no effect / (solution) remains unchanged;
solid NaI is not reacting / aqueous solution of NaI is reacting / surface area of NaI is not relevant in preparing the solution / *OWTTE*; ***[2]***

(d) kinetic energy/speed of reacting molecules increases;
frequency of collisions increases per unit time;
greater proportion of molecules have energy greater than activation energy/*E*a; ***[3 max]***

Accept more energetic collisions.

22. (a)



two curves – one labeled "forward" starting up high up y-axis and one labeled "reverse" starting from zero;
curves merge and become horizontal;
No penalty for failing to label axes.
forward reaction:
highest concentration, thus rate high to begin with;
as reaction proceeds, concentrations decrease, so does rate;
reverse reaction:
zero rate initially/at t = 0 (since no products present);
rate increases as concentration of products increases;
equilibrium established when rate of forward reaction = rate of reverse reaction; 7

(b) (reaction is) endothermic;
Kc increases with (increasing) temperature;
forward reaction favoured/heat used up/OWTTE; 3

[10]

23. $k_c = \frac{[H_2]^3[CO]}{[CH_4][H_2O]}$;

[1]

24. (c) color change from red-brown to darker red-brown of Br_2/red-brown color intensifies/OWTTE;
equilibrium position shifts to the right/products;
to consume H^+; 3

[3]

25. (iii) What Le Chatelier Predicts are the ideal conditions for max yield
Increasing the pressure: **[2]**
Yield increases/equilibrium moves to the right/more ammonia;
4 gas molecules → 2/decrease in volume/fewer gas molecules on right hand side;
Increasing the temperature: **[2]**
Yield decreases/equilibrium moves to the left/less ammonia;
Exothermic reaction/*OWTTE*; 4

The conditions used in industry:
Higher temperature because increases rate; **[1]**
Lower pressure because is less expensive/lower cost of operating at low pressure/reinforced pipes not needed; **[1]** 2
Do not award a mark just for the word "compromise".

[6]